To deduce the width of a gore at any point, let b equal the semi-width corresponding to the angular distance a from the equator of the gore, and b_0 the semi-width of the gore, in degrees at the equator, then, for radius = 1, we have the equation:

$$\tan b = \cos a \tan b_0.$$

In the quadratic fields a may vary from 0° to 45°; taking successive values of a at intervals of 9°, and assuming 5 gores to the field, viz, $b_0 = 9°$, we get the series of relative widths of the gore at successive points shown in fig. 8.

The overlap at seams may be treated in the following manner: In the case of 5 gores to a field, as shown in the foregoing illustrations, there will be in all 32 seams. The lengths of these, which correspond to the length of the edges of the gores, are given in fig. 7 and the sum is found to be 14.648 πR. An allowance of $\frac{3}{4}$ of an inch for overlap seems adequate, and in a balloon 10 feet in diameter this corresponds to about 4 per cent of the width of a gore. This figure may be adopted as convenient; hence, the area of seams is found to be 4.6 per cent of the area of the sphere.

The foregoing numerical data give all that is required in laying out balloons by this plan. In the case of rubber balloons its extreme extensibility renders a large number of gores unnecessary and no doubt a very good balloon can be made simply by uniting the six quadratic fields without subdivision, if large enough sheets of rubber were easily to be had. The maximum size of rubber balloons required in meteorological work will scarcely exceed 6 feet in diameter. The quadratic fields in such a balloon would be 56 inches wide, which is doubtless a greater width of rubber than is easily available. The field can be divided in the middle, necessitating only 12 exactly similar gores to make the balloons each 28 inches wide. The waste in cutting in these cases is a little greater than with a larger number of subdivisions.

BENJAMIN THOMPSON—COUNT RUMFORD.

By Mr. DANIEL T. PIERCE, JR.

Born at Woburn, Mass., March 26, 1753. His father, Benjamin Thompson, and his mother, Ruth Simonds, came of the stock of the first colonists of Massachusetts Bay.

His education was obtained by his own efforts, seconded by instruction from his grandfather; he attended no school except the primary institutions of the town where he was born. "Before he was 14 he could calculate and trace rightly the elevation of a solar eclipse." (Bibliothèque Britannique.) A letter written by him in 1769 to a friend who had assisted him in his studies shows the trend of his mind at the age of 16:

> Please to give the direction of the Rays of Light from a Luminous Body to an Opake, and the Reflection of an Opake Body to another equally Dense and Opake; viz., the Direction of the Rays of the Luminous Body to that of the Opake, and the Direction of the Rays by Reflection to the other Opake Body. N. B. From the Sun to the Earth, Reflected to the Moon at an angle of 40 degrees.

His Tory sympathies caused him to flee to England at the outbreak of the Revolution. Became under-secretary for the colonies under Germaine. Later colonel of the King's American Dragoons, stationed on Long Island. Was proscribed by the New Hampshire alienation act of 1778. (In 1772 he had married at Rumford, now Concord, the widow of Colonel Rolfe.) Returned to England; made fellow of the Royal Society in 1779; knighted by George III in 1784. In the same year he received permission to travel on the Continent, where he met Charles Theodore, Elector of Bavaria, and was from that time to 1797 the dominant influence in the administration of the Electorate, privy counselor, and in command of the army. He continued his investigations in heat and light and invented many appliances for the more economic consumption of fuel, including a kitchen range in which it is claimed that dinner for 1000 persons could be cooked at a fuel expense of four and one-half pennies. Was made count of the Holy Roman Empire in 1791 by the Elector. His labors in the interest of the poor brought him great popularity. In 1795 a marble memorial was erected in his honor in the English Gardens (laid out by him) at Munich, bearing on one side a relief medallion in bronze; a replica of this was long ago made in ivory by an unknown artist and from that a photograph was made by Mr. Thomas B. Gardiner of Washington, D. C.

The ivory replica from which this photograph portrait is taken is now in the possession of Daniel Thompson Pierce, of Washington, D. C., descendant of Josiah Pierce, of Woburn, second husband of the mother of Count Rumford.

Benjamin Thompson—Count Rumford.

In 1796 he gave $5000 each to the Royal Society and the American Society of Arts and Sciences, founding in each case a prize for the most important discoveries in heat and light.

In 1799, the year of the publication of his voluminous essays, he established the Royal Institution of Great Britain. Faraday, who was director of the institution in 1825, accords to Rumford the title of discoverer of the law of the correlation of forces, which, in the words of the former, is the "Highest philosophical idea that the human mind has been able to grasp."

Rumford had intended that the Institution should be to a large extent devoted to industrial work and experimentation in directions which would be of practical value especially to the poor. Meeting opposition in carrying out plans to this end, he abandoned the Institution and went to France, where he married the widow of the famous chemist Lavoisier. He died at Auteuil, near Paris, August 21, 1814, at the age of 61.